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Summary

Cattle grazing corn residue at a low stocking rate maintained body condition score (BCS) and gained more weight than cattle stocked at a heavy level. Corn plant part digestibilities ranged from 69% to 31% and amount of leaf, leaf sheath, and husk was about 15 pounds per bushel of grain. Subsequent grain yields show no difference between grazed, baled, or ungrazed treatments. Grazing corn residue provides a good way to maintain BCS on cows through the winter without effecting grain yield.

Introduction

Corn residue is an inexpensive way for producers to extend their grazing season and reduce the amount of stored forage needed to maintain their cows through the winter. However, with the rising costs of production and the increase in corn price, it becomes important to know how much residue is removed from a field by grazing and baling and how this impacts the grain yields in a continuous corn system. A study by Wienhold et al. (*2013 Nebraska Beef Cattle Report,* p. 40) suggests that removing 20-30% of the corn residue will leave enough residue to maintain soil health and increase soil organic matter. Therefore, the purpose of this study is to look at cattle performance at light and heavy stocking rates, and how much residue is removed with grazing compared to baling and no residue removal.

Procedure

A 130-acre center pivot irrigated corn field near Brule, Neb. was divided into eight paddocks and assigned one of four treatments: ungrazed (UG), baled (B), light grazing (LG, 1 AUM/ac), and heavy grazing (HG, 2 AUM/ac). These treatments have been maintained for four years. Cows were assigned randomly to each treatment, weighed and body condition scored before and after grazing. Cattle grazed the residue for 59 days in 2011 and 69 in 2012 days and were supplemented three times weekly with a 32% protein supplement at a level equivalent to 1 lb/head/day.

Corn plant samples were collected a week prior to harvest from 10 locations within each paddock. Each sample was 32 inches of row and all plants and litter were collected. Samples were separated into parts (stem, shank, leaf blade, leaf sheath, husk, and cob), weighed, dried in 60°C oven for 48 hours, and analyzed for organic matter digestibility. In 2011, the top 1/3 of stem was analyzed separately from the bottom 2/3 of stem and the shank was analyzed separately, but in 2012, the entire stem and shank are included in the same category. Ears from collected plants were shelled and grain yield was used to determine the amount of residue available per bushel of grain. Machine harvested grain yields were measured using the yield monitor on the combine and utilized to determine the effect of treatments on grain yields.

Results

For both 2011 and 2012 there was a significant difference ($P < 0.0001$) in final BCS for cattle assigned to the LG and HG treatments. Cattle in HG treatment lost on average 0.3 BCS and were 33 lb lighter than the LG treatment cattle coming off of the corn field (Table 1). There was no difference between treatments either year for percentage of the plant (2011 $P > 0.2036$; 2012 $P > 0.1981$), IVOMD (2011 $P > 0.3689$), or lb of residue/bu of grain (2011 $P > 0.2333$; 2012 $P > 0.0844$) (Table 2). The Bottom 2/3 of the stem makes up the largest part of the plant comprising 37% of the total followed by leaf blade(20%), cob (16%), leaf sheath (13%), husk (8%), and shank (2%). 2012 yielded

Table 1. Cow body weight and body condition scores for 2011 and 2012, pre and post corn residue grazing.

		Pre BW	Post BW	Pre BCS	Post BCS
Heavy Stocked	2011	896	943	5.5	5.1
	2012	948	1004	5.1	5.0
Light Stocked	2011	907	976	5.5	5.5
	2012	950	1039	5.2	5.3

Table 2. 2011 *In Vitro* organic matter disappearance, percentage of total plant mass, and forage to grain ratio.

	IVOMD	Percentage of Total Plant Mass		Lb of Forage DM/bu Grain	
	2011	2011	2012	2011	2012
Top 1/3 Stem	40.0	3.5	NA	1.3	NA
Bottom 2/3 Stem	31.3	37.0	41.8[1]	13.1	17.3[1]
Leaf Blade	48.8	20.2	22.6	7.4	9.3
Leaf Sheath	47.8	13.5	13.0	4.9	5.4
Husk	69.0	8.2	8.3	3.0	3.4
Cob	42.9	16.2	14.3	5.9	5.9
Shank	38.7	1.5	NA	0.6	NA

2012 Values for Bottom 2/3 include Top 1/3, Bottom 2/3 and Shank.

Table 3. Corn grain yields[1].

	2009	2010	2011
Control	124	141	166
Light Grazing	128	144	160
Heavy Grazing	133	141	170
Baled	124	142	166

[1]bu/ac at 15.5% moisture.

Table 4. Residue removal values.

Treatment	Year	AUM/acre	Lb Forage Available	Percent of Residue Removed
Heavy Grazed	2011	1.9	5157	25.0
	2012	1.9	7029	21.7
Light Grazed	2011	1.0	5303	13.1
	2012	1.0	6358	12.1

similar results with stem being the largest part (41.8%), followed by leaf blade (22.6%), cob (14.3%), leaf sheath (13.0%), and husk (8.3%). Husk was the most digestible part of the corn plant, being 69.0% digestible, and leaf blade was 48.8%, leaf sheath, 47.8%; cob, 42.9;top 1/3 stem, 40.0%; shank, 38.7%; and bottom 2/3 of stem, 31.3%. Grain yields over the past three years (Table 3) show no difference among treatments (*P = 0.9350).*

Conclusion

Stocking rate is such an important factor because of the large differences in nutrient content of the different parts of the corn plant. Fernandez-Riveria et al. (*Journal of Animal Science,* 67:597) determined cattle primarily eat leaf, leaf sheath, and husk. All the forage is available on the day the cattle are introduced to a corn field so the higher quality, more palatable parts, are consumed first. Because there is not any more residue being added, diet quality declines over time and the higher the stocking rate, the faster the decline occurs.

We measured 15.27 and 18.06 lb of palatable feed (leaf blade, leaf sheath, and husk) per bushel of grain yield in 2011 and 2012, respectively. An AU is defined as the amount of forage a 1,000 lb animal consumes, 680 lb DM/month or 22.7 lb/day. When the daily intake was multiplied by the number of grazing days, each AU consumed 1,337 lb DM in 2011 and 1,564 lb of DM in 2012. This is the equivalent of 1.9 and 1.0 AUM/ac for HG and LG respectively. By using the grain yields and lb of residue/bu of grain we can calculate 6,092 and 5,839 lb forage DM/acre for HG and LG respectively. Therefore, the cattle consumed an average of 23.4% and 12.6% of the residue for HG and LG respectively (Table 4). If we assume the diet was on average 55% digestible, 45% of the nutrients consumed are being returned to the field, so cattle are only removing 12.9% and 6.9% of the nutrients in the HG and LG treatments, respectively. These values fall within the acceptable range of residue removal suggested by Wilhelm et. al. The yields from this field support this as they show no effect on yield due to treatment over a three-year period, suggesting that grazing does not have a negative effect on grain yields in continuous corn cropping system. Since there is no negative effect of grazing on yield, this can be an economical alternative to drylot and winter range for cattle producers and provide an extra source of income to corn producers.

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